Building an Insect Trap for BioSCAN Nightwatch

Leslie Dominguez, Cleo Sloan, Tristian Corona, Stephanie Trejo, Gemma Busomi, Viana Garcia, Pamela Joya
LA Makerspace

Abstract

The purpose of this project was to build a successful insect trap to discover the biodiversity of insects in Los Angeles. The trap had to be cheap, simple, and catch a variety of insects. A final design was determined by optimizing the trap based on capture surface area, LED color, and LED intensity. A series of seven trials yielded a simple design composed of a sealed plastic cup containing a single UV LED and placed in a bowl that was filled with water. The final traps were built at LA Makerspace in partnership with the BioSCAN team at the Los Angeles Natural History Museum.

Background

Insects are sensitive to a broad spectrum of light ranging from UV to red (Cruz). UV LED's has been tested to be the best lighting source to capture mosquitos and black flies (Allen). Black flies are able to detect UV, blue and green but they are most attracted to UV (Cohnstaedt). Some flowers have ultraviolet-reflecting nectar guides. And many different types of insects, like mosquitoes and blackflies use the reflecting guides to find nectar (Allen). Insects are able to see and are attracted to UV light. Insects use color sensitivity to forage, navigate and to mate. These characteristics are the same for both ground insects and flying insects, and have influence insect traps to use UV LED's (Cruz).

Experimental Setup

The insect trap was made using a plastic bowl, a clear plastic cup, a rubber band and a translucent plastic material. The cup was glued to the middle of the bowl and the LED's were placed inside the cup. The cups were closed with a translucent plastic material and secured with rubber bands. Soapy water was put in the bowl so when the insects flew into the trap they would be stuck in the water. The different variables that were tested were the surface area of the water in the trap, the wavelength of the LED and the number of LED's used in the trap.

The surface area of the water was tested by varying the size of the plastic bowl. This allowed the amount of soapy water to be varied. The amount of water surface area range from 43.96-280.83 cm^2.

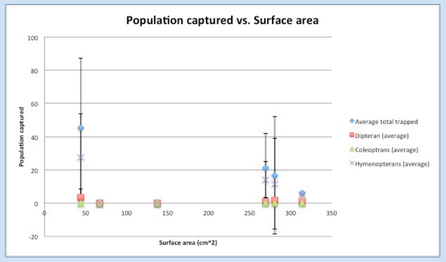
The wavelengths of the LED's were tested by varying color of the LED in the same trap design. The range of LED's used were UV to red with wavelengths in the range of 390-661 nm.

A varying number of LED's used was tested. Every trap had a different amount of UV LED's placed inside. All the other variables were the same. The amount of LED's went from 0-5 lights.

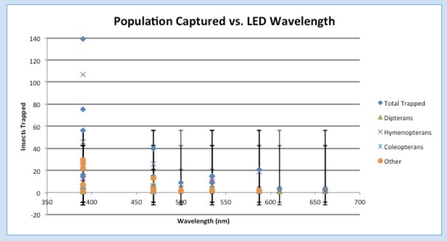
Sorting Procedure

The insects that were caught in the soapy water are put through a filter. All the insects and debris that were collected was put in 95% ethanol for preservation. The insects were then brought from the lab to LA Makerspace. At LA Makerspace, the insects from each trap were sorted and categorized by its characteristics. The insects were placed in the following orders of insects: Diptera, Coleoptera, Hymenoptera, Hemiptera, Neuropteran or other. After the insects were placed in a category they were put in small jars and labeled. Data was collected on how many of insects were collected in each order.

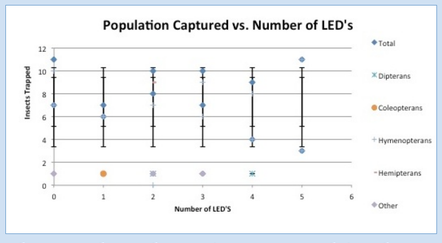
Data



The graph shows that with a large amount of water more insects are caught. When the surface area of the water is at 280.83 cm^2 the most insects were caught, up to 139 insects were trapped.



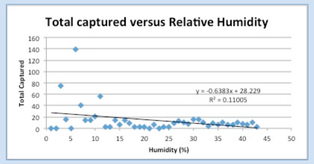
The graph shows that more insects were caught in the wavelengths of 390 nm. At the wavelength of 390 nm, there were up to 139 insects trapped.



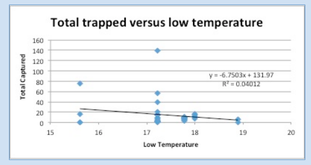
The graph shows that there is no trend in the number of LED's. The number of insects is different; the number of LED's that are used does not matter for the result.

Humidity and Temperature

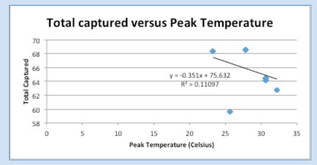
Humidity: 11% correlation, highest amount of insects between 3% and 11% humidity, most insects collected at 6%



Low Temperature: 4% correlation, range from 15.61 to 18.89 Celsius, most insects collected at 17.22°c



Peak Temperature: 11% correlation, temperature ranges from 23.38 to 32.22 Celsius, most insects collected at 27.78 °c



Future Directions

The traps will be deployed around the city of Los Angeles in order to look at the diversity of insects living in the area. The Natural History Museum BioSCAN team will collect the data from the traps. BioScan is hoping to test different hypotheses like how different natural areas in the city vary the biodiversity of insects. Also, how light pollution can affect the insect population in the city of Los Angeles.

Acknowledgements

Natural History Museum of Los Angeles County-
Marine Biodiveristy Center

References

Allen, Sandra A., Jonothan F. Day, and John D. Edman. "Visual Ecology Of Biting Flies." (1987): 1-20. 1987. 12 July 2013.

BioOne Researched Evolved. Entomological Society of America, 2012. Web. 11 July 2013. <http://www.entsoc.org/>.

Bishop, Alan L., Ross Warrel, Lorraine J. Spohr, Harry J. McKenzie, and Idris M. Barchia. "Response of Culicoides Spp. (Diptera: Ceratopogonidae) to Light-emitting Diodes." Australian Journal of Entomology, 2004. Web. 11 July 2013. <http://www.austentsoc.org.au/>.

Cohnstaedt, Lee W., Kateryn Rochon, Adrian J. Duehl, John F. Anderson, Roberto Barrera, Nan-Yao Su, Alec C. Gary, Peter J. Obenauer, James F. Campbell,, Tim J. Lysyk, and Sandra A. Allan. "Arthropod Surveillance Programs: Basic Components, Strategies and Analysis." Arthropod Surveillance Programs: Basic Components, Strategies and Analysis (2012): 1-16.

Cruz, Marianne Shockley, Dr., and Rebecca Lindner. "Insect Vision." (2011): 1-6. University of Georgia Department of Entomology, Nov. 2011. Web. 11 July 2013.